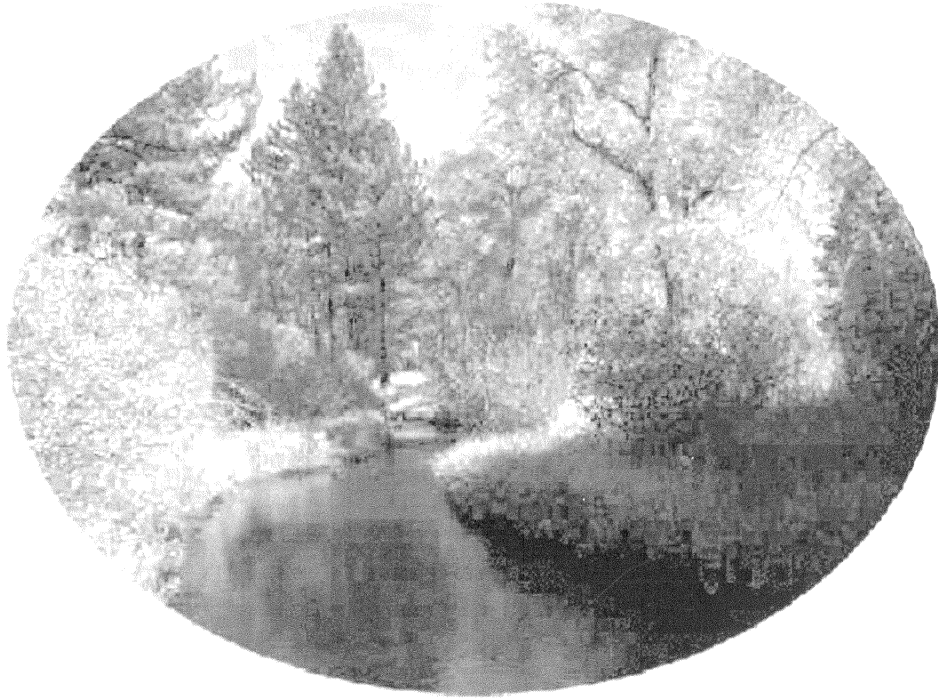


State of California  
The Resources Agency  
DEPARTMENT OF FISH AND GAME



STANDING STOCKS OF FISHES  
IN SECTIONS OF BIG GRIZZLY CREEK  
PLUMAS COUNTY, 2001

by

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# STANDING STOCKS OF FISHES IN SECTIONS OF BIG GRIZZLY CREEK, PLUMAS COUNTY, 2001

## INTRODUCTION

The Department of Water Resources (DWR) initiated an instream flow program in 1976 to identify streams that would benefit from flow enhancement, to assess instream values, and identify actions such as habitat manipulation that could enhance these streams. The Northern District of the DWR selected Big Grizzly Creek below Lake Davis (Figure 1) as one of the streams to study under this program.

Previous sampling on Big Grizzly Creek has been conducted by Department of Fish and Game (DFG) biologists. Initial estimates of rainbow trout (*Oncorhynchus mykiss*) populations were made by the DFG in 1976 (Brown 1976). The DFG also surveyed the creek in 1981, 1986, 1988, 1991, 1994, 1995, 1996, and 1997 to estimate standing stocks of brown trout (*Salmo trutta*) and rainbow trout in selected stations (Bumpass et al. 1989, Brown 1991a, Brown 1991b, Brown 1992, Brown 1995, Brown 1996, Brown 1997, and Brown 1998).

The purpose of this study is to evaluate the effects of the operation of Lake Davis on populations of trout in Big Grizzly Creek through the periodic sampling of fish at established stations in that creek. These data may also be used to measure the recovery of the trout the DFG planted in Little Last Chance Creek following the rotenone treatment that was conducted in October 1998 to kill northern pike (*Esox lucius*) in Lake Davis.

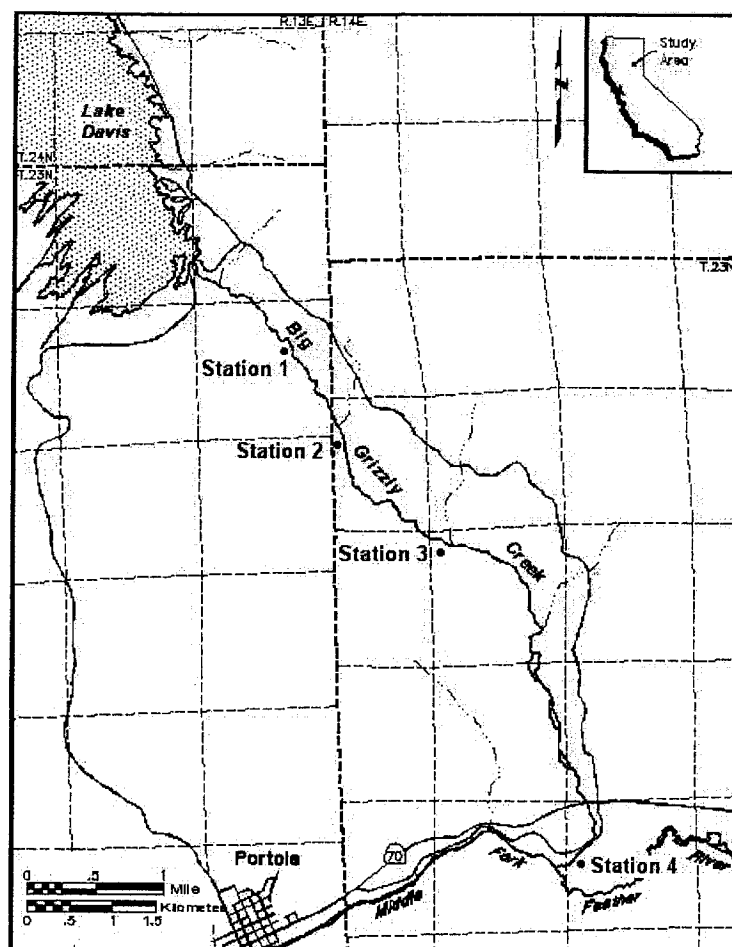


Figure 1. Map of sampling stations in Big Grizzly Creek Plumas County, 2001.

## METHODS

### Physical Measurements

Standing stocks of fishes were estimated at four stations in Big Grizzly Creek in October 2001 (Figure 1). Stations were intentionally selected to be near stations sampled in previous DFG studies (Gerstung 1973). Stations were also selected to represent available habitat in Big Grizzly Creek. Markers were placed in trees along the stream to identify station boundaries. Stations varied in length from 52.7 to 96.3 m (Appendix 1). The length and width of each station was measured with metric tape measures.

## Biological Measurements

Fish were captured with a battery-powered backpack electroshocker in stream sections blocked by seines as described by Platts et al. (1983) (Figure 2). Captured fish were removed from the net-enclosed section on each pass. Standing stock estimates were developed using the two-count method of Seber and LeCren (1967) or the multiple-pass method of Leslie and Davis (1939) with limits of confidence computed using a formula proposed by DeLury (1951).

The weights of trout were measured by displacement (Figure 3). Fork length (FL) of each fish caught was measured to the nearest millimeter.

Standing crops of brown trout and rainbow trout were calculated for individual stations where each species was caught. Age and growth and length-weight relationships were not calculated for both brown or rainbow trout because most of our catch were planted in 1999 by the DFG (Table 1). No other trout have been planted since 1999. The distribution of all fish caught is listed according to location.

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Table 1. Records of trout planted in Big Grizzly Creek by the DFG in 1999.

Species of Fishes	Date	Average Length (mm) of Trout	Number
Rainbow trout	14-Jul	230	1020
Rainbow trout	15-Jul	74	4500
Rainbow trout	15-Jul	30	5496
Rainbow trout	6-Aug	55	1000
Rainbow trout	4-Oct	180	25
Brown trout	15-Jul	54	1000
Brown trout	3-Aug	280	1001
Brown trout	4-Oct	180	25

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## RESULTS

### Distribution

Rainbow trout and brown trout were caught at each station. Sacramento suckers (*Catostomus occidentalis*) were caught in station 3 and station 4, and a black bullhead (*Ameiurus melas*) was caught in station 4 (Table 2).



Figure 2. Electrofishing in Big Grizzly Creek, Plumas County.



Figure 3. Measuring weights of trout by displacement.

Table 2. Distribution of fishes in sections of Big Grizzly Creek, Plumas County, 2001.

Distance below Grizzly Valley Dam (km)	Station Number			
	1	2	3	4
	2.5	3.2	4.8	9.7
Brown trout	X	X	X	X
Rainbow trout	X	X	X	X
Sacramento sucker			X	X
Black bullhead				X

### Standing Crop

We found brown trout and rainbow trout at all four stations. Biomass of brown trout was 2.3 g/m<sup>2</sup> (Table 3). Catchable brown trout (trout greater than or equal to 127 mm FL) biomass averaged 1.4 g/m<sup>2</sup>. Biomass of rainbow trout averaged 2.0 g/m<sup>2</sup> (Table 4). Catchable rainbow trout biomass averaged .7 g/m<sup>2</sup>. Biomass was not estimated for Sacramento suckers or black bullhead.

Table 3. Estimate of brown trout standing crop in Big Grizzly Creek, Plumas County, 2001.

Distance Below Grizzly Valley Dam (km)	Population Estimate	95% Confidence Interval	Biomass (g/m <sup>2</sup> )	Estimate of Catchable Trout	Biomass of Catchable Trout (g/m <sup>2</sup> )
2.5	31	30-35	3.7	9	2.7
3.2	56	51-65	1.2	2	1.2
4.8	10	10-12	1.2	3	0.8
9.7	142	85-229	3.1	15	1

Table 4. Estimate of rainbow trout standing crop in Big Grizzly Creek, Plumas County, 2001.

Distance Below Grizzly Valley Dam (km)	Population Estimate	95% Confidence Interval	Biomass (g/m <sup>2</sup> )	Estimate of Catchable Trout	Biomass of Catchable Trout (g/m <sup>2</sup> )
2.5	25	25-27	2.7	15	2.5
3.2	22	21-26	3.1	14	2.5
4.8	16	16-18	1.8	3	1.4
9.7	12	12-18	0.4	1	0.2

### Length and Weight

Age group 0+ rainbow trout represented 77 percent of the 67 rainbow trout caught and ages 1+ comprised 19 percent (Figure 4). Planted trout made up and 4 percent of the catch. Age group 0+ brown trout made up 79 percent of the 171 brown trout caught. Age 1+ comprised 11 percent (Figure 5) and planted trout made up 10 percent.

The relationship between fork length and weight (W) of age 0+ and 1+ rainbow trout for Big Grizzly Creek is:

$$\begin{aligned}\text{Log}_{10}W &= -10.5 + 2.9 \text{Log}_{10}FL \\ r^2 &= 0.99 \\ N &= 67 \text{ (Figure 6 and Appendix 2)}\end{aligned}$$

The same relationship for brown trout is:

$$\begin{aligned}\text{Log}_{10}W &= -4.8 + 2.9 \text{Log}_{10}FL \\ r^2 &= 0.99 \\ N &= 171 \text{ (Figure 7 and Appendix 3)}\end{aligned}$$

### Age and Growth

The formula  $FL = 6.4 + 0.2 S$  describes the relationship between the fork length and enlarged scale radius (S) of 19 rainbow trout caught in Big Grizzly Creek. The coefficient of correlation ( $r^2$ ) is 0.53. The formula was  $FL = 16 + 0.2 S$  for 30 brown trout, while the value for  $r^2$  is 0.99. These values are for age 1+ trout only. Age 2+ and older trout were of hatchery origin.

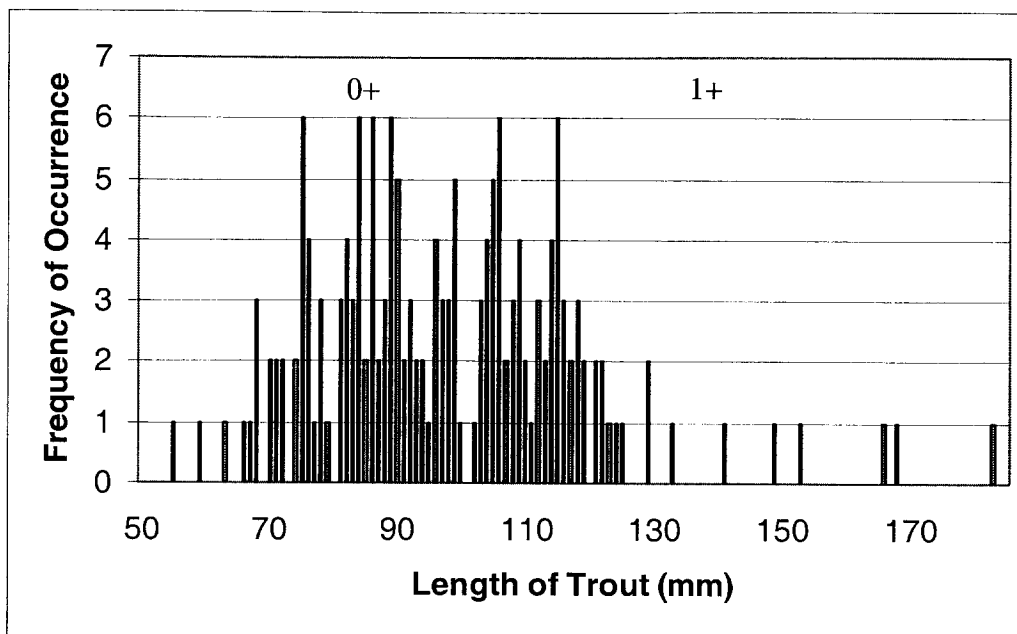


Figure 4. Length, observed frequency, and age of brown trout caught in Big Grizzly Creek, Plumas County, 2001

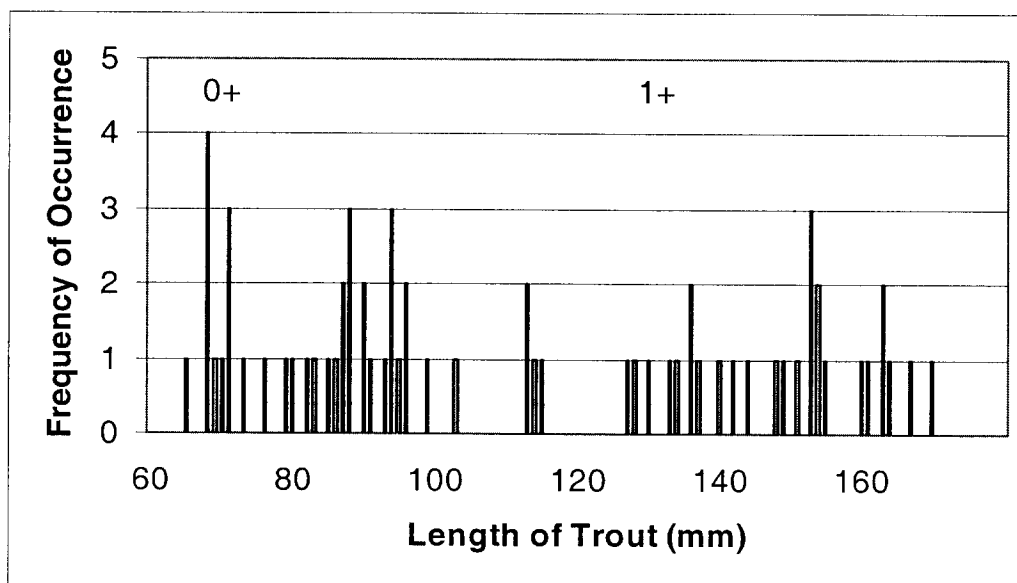


Figure 5. Length, observed frequency, and age of rainbow trout caught in Big Grizzly Creek, Plumas County, 2001.



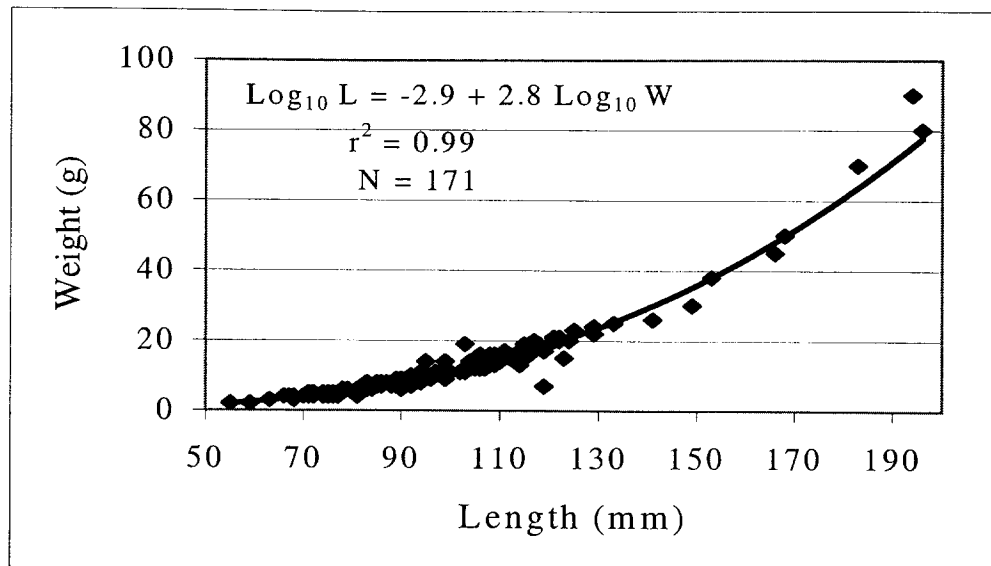


Figure 6. The relationship between length and weight of rainbow trout caught in sections of Big Grizzly Creek, Plumas County, 2001.

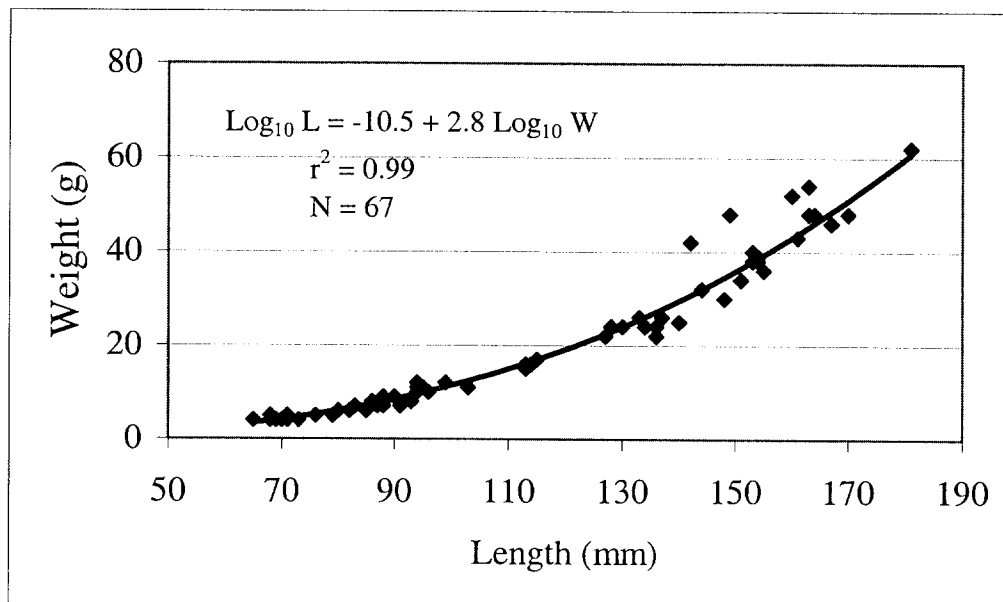


Figure 7. The relationship between length and weight of brown trout caught in sections of Big Grizzly Creek, Plumas County, 2001.

## Coefficient of Condition

The average coefficient of condition for 70 rainbow trout was 1.1563 and 1.1322 for 73 brown trout. Age 0+ rainbow trout had slightly higher coefficients of condition than brown trout of the same age group. Age 2+ rainbow and brown trout were not included. They were of hatchery origin so their condition did not necessarily reflect stream conditions. (Table 5).

Table 5. Condition of rainbow trout and brown trout in Big Grizzly Creek, Plumas County, 2001.

Age Group	Number of Trout	Coefficient of Condition	95% Confidence Interval
Rainbow trout			
0+	56	1.1551	0.9033-1.4069
1+	15	1.1554	0.9356-1.3731
Combined	71	1.1563	0.9076-1.4049
Brown trout			
0+	64	1.1335	0.9308-1.3363
1+	9	1.0986	0.7608-1.4364
Combined	73	1.1322	0.9099-1.3546

Summer streamflow in Big Grizzly Creek has generally been between 0.6 and 0.3 cms from 1974 to 2001. Higher flows occurred in 1977 and 1979 (Table 6). Haines (1982) reported that optimum flow for rainbow trout was 0.6 cms. Her recommendation was based on an instream flow study that the DWR conducted in 1981. The DWR bases flow releases from Lake Davis on lake water levels in the spring. Lake water levels were low from 1988 through 1994 so minimum releases (0.3 cms) were the rule. Releases were higher from 1995 through 1999, but they dropped again in 2000 and 2001.

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Table 6. Average summer streamflow in Big Grizzly Creek, 1974-2001.

Year	Flow (cms)	Year	Flow (cms)
1974	0.7	1989	0.3
1975	0.4	1990	0.3
1976	0.3	1991	0.3
1977	1.8	1992	0.3
1978	0.3	1993	0.3
1979	2.2	1994	0.3
1980	0.4	1995	0.6
1981	0.3	1996	0.6
1982	0.6	1996	0.6
1983	0.6	1997	0.6
1984	0.6	1998	0.6
1985	0.5	1999	0.6
1986	0.6	2000	0.3
1987	0.5	2001	0.3
1988	0.3		

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Biomass of rainbow trout has averaged  $3.4 \text{ g/m}^2$  and ranged from 1.0 to  $7.3 \text{ g/m}^2$  since we began sampling in 1976 (Table 7). There is no significant correlation between streamflow and biomass ( $r^2 = 0.001$ ) because rainbow trout biomass was lower in 1986 and 1995 than we expected from the relative high summer flows that were released that year. Brown trout biomass has averaged  $1.1 \text{ g/m}^2$  and ranged from 0 to  $3.8 \text{ g/m}^2$ . Brown trout biomass is not correlated with flow ( $p > 0.05$ )

Table 5. Biomass (g/m<sup>2</sup>) of rainbow and brown trout in Big Grizzly Creek.

Year	Rainbow trout	Brown trout
1976	1.9	-
1981	1.8	0.1
1986	3.2	3.8
1988	5.6	0.4
1994	2.2	0.7
1995	1.0	0.5
1996	4.5	0.5
1997	7.3	2.2
1998	1.6	3.1
1999	0.0	6.0
2000	2.0	2.3
2001	2.0	2.3

## DISCUSSION

Our sampling has not revealed the presence of northern pike in Big Grizzly Creek. We sample in riffles and shallow pools because our electrofisher is not effective in deeper pools. Pike are more likely to occur in deeper pools. If sampling for pike was our primary objective, we would gill net pools in addition to electrofishing.

We have not established a significant relationship between flow and trout standing crop or biomass. We think a significant relationship exist between streamflow and trout populations in Big Grizzly Creek, but more data points are needed. More years of sampling will probably establish such a relationship.

Wide confidence intervals of trout population estimates continue to be a problem in station 4. This is a problem because a wide pool at the upstream end of the station allows trout to swim around the sampling team on each pass. This station also harbors a large proportion of young-of-the-year trout. Small fish are difficult to stop with an electrofisher because they present less surface to the electrical current.

The year 2002 should be the first year since Big Grizzly Creek was poisoned that all ages of trout in the stream would have been hatched in the gravels of the creek. All trout will reflect the stream conditions of the years of their growth. If sampling is conducted in 2002 scales will be taken from all trout older than 0+ and calculations on age and growth can be made for ages 1+ and 2+ trout.

## LITERATURE CITED

- Brown, C.J. 1976. Standing stocks of fishes in sections of Red Clover Creek, Little Last Chance, Big Grizzly, Last Chance, and Squaw Queen creeks, Plumas County, 1976. Calif. Dept. Fish and Game, 15 p.
- \_\_\_\_\_. 1991a. Standing stocks of fishes in sections of Big Grizzly Creek, Plumas County, 1981. Calif. Dept. Fish and Game, 18 p.
- \_\_\_\_\_. 1991b. Standing stocks of fishes in sections of Big Grizzly Creek, Plumas County, 1988. Calif. Dept. Fish and Game, 18 p.
- \_\_\_\_\_. 1992. Standing stocks of fishes in sections of Big Grizzly Creek, Plumas County, 1991. Calif. Dept. Fish and Game, 21 p.
- \_\_\_\_\_. 1995. Standing stocks of fishes in sections of Big Grizzly Creek, Plumas County, 1994. Calif. Dept. Fish and Game, 27 p.
- \_\_\_\_\_. 1996. Standing stocks of fishes in sections of Big Grizzly Creek, Plumas County, 1995. Calif. Dept. Fish and Game, 22 p.
- \_\_\_\_\_. 1997. Standing stocks of fishes in sections of Big Grizzly Creek, Plumas County, 1996. Calif. Dept. Fish and Game, 22 p.
- \_\_\_\_\_. 1998. Standing stocks of fishes in sections of Big Grizzly Creek, Plumas County, 1997. Calif. Dept. Fish and Game, 22 p.
- Bumpass, D.K., K. Smith, and C.J. Brown. 1989. Standing stocks of fishes in sections of Big Grizzly and Little Last Chance creeks, Plumas County, 1986. Calif. Dept. Fish and Game, 36 p.
- DeLury, D.B. 1951. On the planning of experiments for the estimation of fish populations. J. Fish. Res. Bd. Canada. 8:281-307.
- Gerstung, E.R. 1973. Fish populations and yield estimates from California streams. Cal-Neva Wildlife 9-19.
- Haines, S.L. 1982. Upper Feather River flow study. Calif. Dept. Water Resources. 35 p.
- Leslie, P.H., and D.H.S. Davis. 1939. An attempt to determine the absolute number of rats in a given area. J. Animal Ecology. 8:94-113.

Platts, W.S., W.F. Megahan, and G.W. Minshall. 1983. Methods for evaluating stream, riparian, and biotic conditions. Gen. Tech. Rep. INT-138. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experimental Station; 1983. 70p.

Seber, G.A.F., and E.D. LeCren. 1967. Estimating population parameters from catches large relative to the population. J. Animal Ecology. 36(3):631-643.

## APPENDIX 1

### PERMANENT FISH POPULATION STATIONS FOR BIG GRIZZLY CREEK, PLUMAS COUNTY SEPTEMBER, 2001

Station 1 (Stream Gage Station) - Station 1 is located 1.8 stream km below Grizzly Valley Dam and just downstream from an abandoned USGS stream gage at an elevation of 1622 m MSL. The station begins at a concrete weir near a stream gage (UTM 170 167). The stream within the station is a riffle (67%) with several split channels and small pocket pools that ends in a long, shallow pool (33%). It is 59.1 m long and has a surface area of 331.6 m<sup>2</sup> at 0.56 cms. Substrate is 75% boulders, 15% rubble, and 10% sand.

Station 2 (IFN Station) - Station 2 is 3.1 stream km below Grizzly Valley Dam. The site located at UTM 176 156 at an elevation of 1610 m MSL. The upper end of the station is a steep rapid (55%) followed by two deep pools (45%) separated by short rapids. The substrate is mostly rubble (60%), boulder (20%), gravel (10%), with areas of sand (10%) in the pools. The station is 53.3 m long with a surface area of 180.5 m<sup>2</sup> at 0.56 cms.

Station 3 (3-Mile Station) - Station 3 is located 5.2 km downstream from Grizzly Valley Dam at an elevation of 1549 m MSL at UTM 189 141. The station begins in a steep rapid followed by more gradual rapids (75%) with pocket pools and two larger pools (25%) near the lower end. Substrate is boulder (65%), rubble (20%), sand (10%), and gravel (5%). The station is 52.7 m long and has a surface area of 263.3 m<sup>2</sup> at 0.56 cms.

Station 4 (6-Mile Station) - Station 4 is located 10.4 km below Grizzly Valley Dam and 0.2 km above the confluence with the Middle Fork Feather River at an elevation of 1488 m MSL. It is located at UTM 205 106. The station begins in a rapid just above a large 0.7 m deep pool (33%) followed by several riffle areas (67%) and shallow pools with undercut banks and overhanging grass clumps. Substrate is rubble (10%), gravel (75%), bedrock (10%), and mud (5%). The station is 96.3 m long with a surface area of 455 m<sup>2</sup> at 0.56 cms.

## APPENDIX 2

### LENGTH AND WEIGHT OF RAINBOW TROUT CAUGHT IN BIG GRIZZLY CREEK, 2001

Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)
65	4	99	12
68	4	103	11
68	4	113	16
68	5	113	15
68	4	114	16
69	4	115	17
70	4	127	22
71	5	128	24
71	5	130	24
71	4	133	26
73	4	134	24
76	5	136	22
79	5	136	24
80	6	137	26
82	6	140	25
83	7	142	42
85	6	144	32
86	8	148	30
87	7	149	48
87	7	151	34
88	9	153	38
88	7	153	40
88	8	153	38
90	9	154	39
90	9	154	38
91	7	155	36
93	8	160	52
94	12	161	43
94	11	163	54
94	10	163	48
95	11	164	48
96	10	167	46
96	10	170	48
		181	62



# APPENDIX 3

## LENGTH AND WEIGHT OF BROWN TROUT CAUGHT IN BIG GRIZZLY CREEK, 2001.

Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)
55	2	81	6	90	8
59	2	82	7	90	9
63	3	82	6	90	8
66	4	82	7	90	8
67	4	82	6	90	6
68	4	83	8	91	8
68	4	83	7	91	9
68	3	83	6	92	9
70	4	84	7	92	10
70	4	84	7	92	7
71	5	84	7	93	9
71	4	84	7	93	9
72	5	84	7	94	11
72	4	84	6	94	8
74	4	85	8	95	14
74	5	85	7	96	9
75	5	86	7	96	10
75	5	86	7	96	9
75	5	86	8	96	10
75	4	86	7	97	11
75	5	86	7	97	10
75	4	86	7	97	10
76	5	87	8	98	11
76	5	87	8	98	10
76	4	88	8	98	10
76	5	88	7	99	10
77	4	88	7	99	11
78	5	89	7	99	11
78	6	89	9	99	14
78	5	89	9	99	9
79	6	89	8	100	11
81	4	89	8	102	11
81	5	89	8	103	19

# APPENDIX 3

## LENGTH AND WEIGHT OF BROWN TROUT CAUGHT IN BIG GRIZZLY CREEK, 2001. (CONTINUED)

Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)
103	11	113	15	153	38
103	12	114	17	166	45
104	12	114	17	168	50
104	14	114	17	183	70
104	12	114	13	194	90
104	13	115	16	196	80
105	12	115	19		
105	12	115	15		
105	14	115	15		
105	14	115	15		
105	13	115	15		
106	14	116	18		
106	14	116	16		
106	16	116	19		
106	14	117	18		
106	15	117	20		
106	12	118	19		
107	12	118	19		
107	14	118	18		
108	16	119	17		
108	16	119	17		
108	13	121	21		
109	15	121	20		
109	13	122	20		
109	15	122	21		
109	16	123	15		
110	15	124	20		
110	14	125	23		
111	17	129	24		
112	16	129	22		
112	15	133	25		
112	16	141	26		
113	15	149	30		